

Housekeeping Tip

Long-Term Frequent Use of Some Household Products May Affect Heart Rate Variability

Use of household cleaning products may be accompanied by inhalation of volatile organic compounds (VOCs) and the secondary pollutants created by their reactions with other airborne compounds. Indoor exposure to these chemicals has been associated with conditions ranging from mucosal membrane irritation to poor concentration. A new study suggests that heavy use of some household cleaning and air-freshening products may have an adverse effect on cardiovascular function [*EHP* 120(7):958–964; Mehta et al.].

The study drew on data collected through the Swiss Cohort Study on Air Pollution and Lung and Heart Diseases in Adults (SAPALDIA), a prospective cohort study involving 9,561 adults that began in 1991. Upon enrollment, participants underwent medical examinations and completed a detailed health questionnaire. A second round of assessments occurred in 2001–2003, for which one subset of 3,255 participants completed a detailed questionnaire about household cleaning activities, and another subset of 1,846 participants aged 50 years or older underwent 24-hour electrocardiogram (ECG) monitoring. The current study was a cross-sectional analysis of 581 participants aged 50 years or older, mostly women, who completed both the questionnaire and the ECG monitoring. Many of the participants were full-time homemakers.

The ECG monitoring focused on four summary measures of heart rate variability (HRV), reduced HRV being a marker of cardiac dysfunction. Participants reported use of several different household sprays and scented products. Lung-function test results and self-reported symptoms reflected the state of participants' pulmonary health. Statistical analysis assessed HRV measures in association with frequency of use of cleaning sprays, air-freshening sprays, and scented products, as well as with the number of different sprays used weekly. The investigators adjusted for individual health and cardiovascular risk factors, as well as for alternative sources of other indoor air pollutants.

Long-term frequent use of all product types was associated with reduced HRV, with the strongest association for air-freshening sprays. Associations were stronger among individuals with evidence of obstructive lung disease (not including asthma). Limitations include the cross-sectional design (which represents only a snapshot in time), reliance on self-reported exposures, potential selection bias, and uncontrolled confounding. However, the reported associations were strong, suggesting widespread heavy use of these types of products could have a significant public health impact if the observed associations represent casual effects. More rigorous study is needed, including longitudinal observations, direct exposure assessment, and chemical characterization of VOCs and secondary pollutants in homes' indoor and outdoor air.

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Glow Fish

A New Biosensor to Detect How Environmental Estrogens Affect Tissues

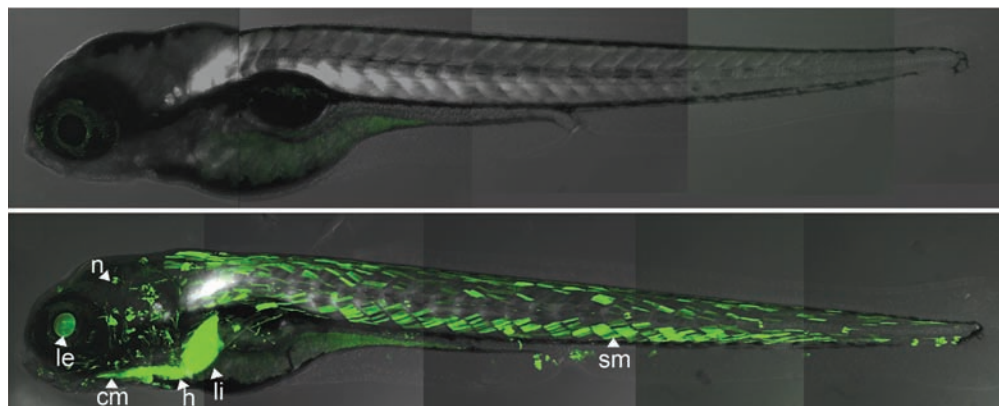
Chemicals that mimic natural estrogens have well-documented effects on the reproductive systems of vertebrates, typically acting as endocrine disruptors, but scientists know much less about how these chemicals affect other tissues and body systems. Investigators have explored zebrafish transgenically modified to glow with green fluorescent protein (GFP) as a way to detect effects of different estrogenic chemicals in real time. A British team now confirms and improves upon previous work by developing an even more sensitive transgenic zebrafish biosensor for assessing potential endocrine disruptors [*EHP* 120(7):990–996; Lee et al.].

Earlier transgenic models reported exposure only in certain tissues or at very high doses. In the current study, the investigators exposed embryonic transgenic zebrafish at 1 hour postfertilization to environmentally relevant doses of five different estrogenic chemicals: the plasticizer bisphenol A (BPA), the industrial surfactant 4-nonylphenol (NP), the natural steroids estrogen and 17 β -estradiol (E_2), and 17 α -ethinylestradiol (EE_2), a synthetic hormone widely used in contraceptive pills and hormone replacement therapy.

Tissues such as the liver, forebrain, lateral line (a sensory system found in aquatic vertebrates), otic vesicles, eyes, heart, and cranial and somite muscle appeared to be strongly affected by some of the compounds tested, but not others. The study also found that different tissues' response to EE_2 was time dependent. For example, liver, heart, and muscle tissue began to glow 24 hours postfertilization and reached maximum strength at 96 hours, whereas a significant increase in fluorescence was seen in the otic vesicles 48 hours postfertilization, and in the eyes and forebrain after 72 hours.

Based on this study, the zebrafish biosensor seems a promising and powerful system to test the impacts of a variety of estrogenic chemicals in a living vertebrate at low, environmentally relevant doses. The authors suggest the system could be developed for high-throughput screening, an urgent need in the study of endocrine-disrupting chemicals.

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A new transgenic zebrafish model offers a more sensitive method for studying responses to environmentally relevant doses of estrogenic chemicals. These images show 4-day-old zebrafish larvae exposed as embryos to water alone (top) or to water spiked with 100 ng/L E_2 (bottom). Tissues affected by the estrogen exposure glow green—in this case, the cranial muscle (cm), heart (h), lens (le), liver (li), neuromasts (n) of the lateral line, and somite muscle (sm).